Identification and study of factors contributing to the creation of a sustainable environment of southern Chotanagpur Division

A

SYNOPSIS

Submitted in partial fulfillment of the

Requirements for the award of a degree

Of

Doctor of Philosophy

In the

Department of Geography

Submitted to

YBN UNIVERSITY

RAJAULATU, NAMKUM, RANCHI

JHARKHAND-834010(INDIA)

June, Year-2020

Research Supervisor:

Dr. Kailash Nath Singh

Professor, Department of Geography

YBN University, Ranchi

Research Scholar:

Imran Khan

Enrollment No: YBNU2001415

Department of Geography

YBN University, Ranchi.

Contents

1. Introduction 3
2. Literature Review 8
3. Problem Statement 13
4. Objective 14
5. Research Methodology / Tools 14
Tools 14
6. Data Collection 14
7. Brief Chapter Plan 15
References 16

1. Introduction

Principles of Sustainable Development There is more to the understanding of the concept of what sustainable development means beyond a simple one-sentence definition. The Rio Declaration on Environment and Development (UNEP 1972) flashes out the definition by listing 18 principles of sustainability which may be summarised as below. The declaration emphasises that people are entitled to a healthy and productive life while maintaining the health and integrity of the Earth's ecosystem. The current developments in anyways must not undermine the development and environment needs of present and future generations. Nations should use precautionary approach to protect the environment by using their own resources, but without causing environmental damage beyond their borders. They should develop international laws to provide compensation in case of trans-border damage and impacts. Also, nations should frame effective environmental laws, including laws for the victims of pollution and other environmental damage. As the declaration adds that the polluter should, in principle, bear the cost of pollution. In order to achieve sustainable development, the declaration says that eradicating poverty, reducing disparities in living standards in different parts of the world, eliminating unsustainable patterns of production and consumption and open international economic system are essential to achieve a sustainable economic growth. Environmental issues will be best handled with full participation of the citizens including women and therefore nations should increase and encourage public awareness by making environmental information widely available to all. They should share and expand the knowledge of innovative technologies to achieve the goal of sustainability. Most importantly, it emphasizes that peace, development and environmental protection are interdependent and related to each other. The Nations must respect international laws protecting the environment in times of war and should cooperate in positive establishment.

Sustainability is important to every living thing on this planet and it seems as though everyone (businesses, in particular) has a different idea as to what sustainability really means. Some break this process down into three pillars of sustainability, others discuss it as 12 practices, and many surmise that sustainability can be broken down into six distinct factors. According to Repsol, these are the six factors of sustainability as follows,

Climate change: There is a reason that climate change appears first on so many lists about sustainability. Climate change is perhaps the greatest crisis affecting our planet today. It stems from one major cause, namely, the gradual warming of the planet due to greenhouse gases produced by the burning of fossil fuels. The results of it are a shift in climate and weather patterns across the globe. Devastating wildfires, frequent, destructive tropical storms, heretofore unseen heat waves, and rising sea levels are just a taste of the destructive power of climate change. Environmental changes, namely climate change, land-use/land cover changes and natural resource degradation have aggravated drought occurrences and vulnerability, thus disrupting the normal socio- economic settings. With urbanization, the surface gets modified leading to alterations of heat exchange, water, trace gases, aerosols and the momentum between the land surface and overlying atmosphere. Increased temperature due to enhanced aerosol emissions and greenhouse effect is also found responsible for the changes in climatic mean and incidence of extreme events such as floods and droughts.If there is no moisture in the soil to evaporate, the incident solar radiation further contributes to raise the temperature which results in more prolonged and intense drought conditions.In the recent past decades, fast urban-industrial growth over Ranchi is responsible for bringing about large-scale changes in the land use/land cover and thereby change in albedo. In addition, enhanced industrial and vehicular emissions are changing the atmospheric chemistry of the air at micro-level as greenhouse gases and aerosols are continually increasing. Besides, global level warming and resultant climate change may also be reflected in changing nature of droughts at local level. The present study therefore attempts to detect the impact of these environmental changes upon the nature of droughts over Ranchi city. The study mainly focuses on understanding and relating the changing trends in the incidence, intensity, frequency and periodicity of droughts over time with changing natural environment.

Environment: Environmental sustainability might be defined as how well we preserve the sanctity of our environment. This could mean developing more sustainable methods of procuring and using tangible natural resources like wood, metal, or water, as well as more ephemeral resources like electricity. This factor is all about moderation as a species. We need to curb our unchecked consumption of natural resources in order to be more sustainable.

A city is an expression of coexistence between its users and built environment. The way in which its spaces are animated signify the quality of this coexistence. Urban sustainability is the ability of a city to respond efficiently towards its people, culture, environment, visual image, history, visions and identity. The quality of built environment determines the quality of our lifestyles, but poor ability of the built environment to adapt and sustain itself through the changes leads to degradation of cities. Ranchi was created in November 2000, as the capital of the newly formed state Jharkhand, located on eastern side of India. Before this Ranchi was known as summer capital of Bihar and was a little larger than a town in terms of development. But since then it has been vigorously expanding in size, infrastructure as well as population. This sudden expansion has created a stress on existing built environment. The large forest covers, agricultural land, diverse culture and pleasant climatic conditions have degraded and decreased to a large extent. Narrow roads and old buildings are unable to bear the load of the changing requirements, fast improving technology and growing population. The built environment has hence been rendered unsustainable and unadaptable through fastidious changes of present era. Some of the common hazards that can be easily spotted in the built environment are half-finished built forms, pedestrians and vehicles moving on the same part of the road. Unpaved areas on street edges. Over-sized, bright and randomly placed hoardings. Negligible trees or green spaces. The old buildings have been poorly maintained and the new ones are being constructed over them. Roads are too narrow to cater to the increasing traffic, both pedestrian and vehicular. The streets have a large variety of activities taking place on them, but haphazardly. Trees are being cut down for road widening and new constructions. There is no space for greenery in the commercial as well as old residential areas. The old infrastructure is deteriorating because of poor maintenance and the economic limitations. Pseudo understanding of functionality as well as aesthetics drive the new infrastructure. It is hence necessary to evaluate the extent of sustainability of existing built environment of the city and create or regenerate the existing built environment into a more sustainable and adaptable one.

People: Human nature does not intrinsically allow us to be sustainable, but that does not mean that it is not within our power to be so. If we, as individuals, do not strive for sustainability, if we cannot admit that we are accountable as stewards for our planet, then true sustainability will never be achieved. We must learn how to feed, clothe, and entertain ourselves using sustainable means or risk failing on all counts.

Ethics: As with the factor above, ethics is about accountability as an individual. We need to treat our planet with respect, and we need to do the same with the flora and fauna that share it with us. Things like eating a more sustainable diet and engaging in sustainable and ethical farming practices are forms of ethical sustainability. In terms of business, it might mean being more transparent about the unsustainable parts of operations and amending them to be more sustainable.

Innovation: The last two portions of this list are key to future sustainability. As a species, we must strive towards innovations that make us more sustainable. These innovations don't necessarily have to be technological; they can be philosophical or socioeconomic. We need to change the way we see the world and each other in order to fix the problems that many of us choose to ignore.

Technology: Sustainability through technology has been our saving grace in recent years. Many countries have already begun to adopt new renewable technologies on a grand scale, replacing antiquated and polluting methods of energy production. According to the Iowa Agricultural Literacy Foundation, some companies have begun adopting new agricultural technological advances to help grow crops and use fewer resources. It's a sign that things are changing for the better, but worldwide adoption needs to happen for our species to be truly sustainable. At the same time, technologies and practices must continue to improve.

1.3 Sustainable environment of southern Chotanagpur Division

Chotanagpur is one long undulating sweep of hills which occupy the southern quarter of the province of Bihar. Its total area is 44,000 sq miles (about the size of England) and is divided into the districts of Hazaribagh, Ranchi, Palamau, Manbhum and Singhbhum and the princely states of Kharsawan and Saraikela. At the centre of the region is a great plateau averaging 2000 feet in height, with ridges running out as far as Bengal. Parasnath, the highest mountain of Chotanagpur lies on the eastern boundary of Ranchi.8 To the Aryans in ancient times and to later Muhammedan invaders in the medieval period, the whole of Chotanagpur and the adjoining hill states was known as 'Jharkhand' or 'the forest tract'. The name indicates that the whole of Chotanagpur was at one

time a huge forest consisting mainly of sal (Shorea robusta) trees from which isolated hills stood out covered with upper mixed forest as shown in figure below.

Fig: Chotanagpur Region

Source:

A fine balance between people and environment had been critically destabilised as direct consequence of the penetration of a western economic system into the deep forest regions in the wake of the economic and forest policy changes of colonial rule. As a direct result of this the sustainable economy of the tribal peoples, and above all their resistance to drought and famine, had become permanently disrupted. They then became more vulnerable to the inroads of rapacious landlords, moneylenders and private capital in general. While similar developments took place throughout the colonial (and post-colonial) period in many parts of 'tribal' India the ecological background to the 1897 Chotanagpur throws useful light on the very sharply correlation between ecological degradation, forest reservation and the onset of famine conditions. Historically, too, the ecological subversion of tribal society imitated a process in which the tribal peoples of Southern Bihar were increasingly denied almost their entire entitlement to the resources of the region, a

process so alienating and distinctively oppressive as to forge the foundations and motivations for a separate political identity in a putative 'Jharkhand' state much later on.

2. Literature Review

Khan .K., Babar, S.F., Oryani, B. *et al.* (2022). They state that environmental sustainability concerns are increasing worldwide; both developing and developed countries face environmental degradation. Literature has highlighted the environment-growth nexus; however, the impact of environmental-related technologies on the environment is ignored in early studies. This study aims to explore the implications of financial development, environmental-related technologies, research and Environmental sustainability concerns are increasing worldwide; both developing and developed countries face environmental degradation. Literature has highlighted the environment-growth nexus; however, the impact of environmental-related technologies on the environment is ignored in early studies. This study aims to explore the implications of financial development, environmental-related technologies, research and development, energy intensity, renewable energy production, natural resource depletion, and temperature in a sustainable environment in Canada by using a time series model, i.e., dynamic ARDL simulations (Jordan and Philips 2018) with data from 1989 to 2020. The examined findings of the dynamic ARDL simulations indicate that environmental-related technologies in Canada help to reduce environmental degradation both in the short run and in the long run. At the same time, financial development, energy intensity, renewable energy production, research and development, natural resource depletion, and temperature causes boost the environmental degradation in Canada. To achieve sustainable environment, Canada needs to improve innovations in the environmental-related technologies for achieving sustainable growth and environment.

Kumari, N., & Pandey, S. (2022),River water, the most important natural resource, also considered as a limiting resource in terms of growth and livelihood. Some prominent issues like water scarcity, water pollution, heavy metal pollution, and degradation of water biomes impacted the terrestrial and aquatic ecosystem with extreme severity. This chapter studied the concept of a modeling approach to analyse the status of hydrological regime of the Jumar river and its catchment area which lied in Ranchi district of Jharkhand, Eastern India. The sustainability of

Jumar river was found highly sensitive to extreme events like water scarcity and drought conditions. The frequent droughts in summer and overflow in rainy season resulted in eutrophication, soil erosion and sediment pollution in Jumar river basin. This overflow in rainy season was caused due to inflow from non-point sources of water pollution.

Kumar, M., Gupta, J., & Radhakrishnan, A. (2016), The present study assesses the extent of contribution of Dairy based production system towards the sustainable livelihood of the tribes in Jharkhand. Out of 24 districts of Jharkhand, Govindpur and Ormanjhi blocks of Dhanbad and Ranchi districts respectively were randomly selected for the study. From these two blocks, four villages were selected randomly and from each village 30 tribal farmers were again selected randomly, constituting a total number of 120 respondents. The data were collected through Participatory Rural Appraisal (PRA) and personal interviews during the year 2013-14. The results indicated that the livelihoods of tribal communities in the area have traditionally been dominated by Dairy Production System (DPS) - C+B+G (C=Cattle, B=Buffalo, G=Goat). Among the sustainable livelihood components human capital was minimum compared to others and use of traditional knowledge (5.98), farm energy (5.95), ICT Tools (5.71), livestock density (5.97) and access to natural resources (5.85) had highest influence on sustainable livelihood of the respondents. The DPS prevalent in the area substantially contributed for the sustainable livelihood of the respondents and was the integral part of day-to-day livelihood activities, nutritional security and traditional life style of tribal people in the area.

Mehta, S., & Kumar, A. (2019),Cities are pivotal to India's growth and economic development. However, the rapid horizontal and vertical expansion in what many call the "messy and hidden" process of urbanisation compels scholars and policymakers to look for concrete solutions to the various problems brought about by urbanisation. This report studies the case of the city of Ranchi, the administrative capital of Jharkhand, one of the cities selected under the Government of India's 'Smart Cities Mission' (SCM). The report provides an overview of Ranchi and evaluates the city vis-à-vis the vital dimensions of a smart city. It discusses the challenges in developing Ranchi into a smart city and the initiatives by the state government to make the city vibrant, viable, habitable, inclusive and sustainable. The report concludes with policy prescriptions that should facilitate Ranchi's transformation into an inclusive and sustainable smart city.

Kumar, M., Gupta, J., Radhakrishnan, A., & Singh, M. (2015),Pig farming provides subsistence for millions of small and marginal farmers and landless labourers. The present study was conducted in two randomly selected districts of Jharkhand in 2013-14. The study assessed the extent of contribution of pig-based production system towards the sustainable livelihood of the tribes of Govindpur and Ormanjhi blocks of Dhanbad and Ranchi districts. The data were collected from 120 randomly selected households and the study was conducted through personal interviews of the selected respondents, personal observations and participatory rural appraisal techniques viz transect walk, social mapping, key informant interview, focus group discussions etc. The results indicated that the livelihood of tribal communities in the area had traditionally been dominated by the pig-based production system- cattle + goat + pig (C + G + P). The pig-based production system prevalent in the area was found to be substantially contributing to the sustainable livelihood of the respondents and was the integral part of day-to-day livelihood activities, nutritional security and traditional lifestyle of the tribal people in the area.

Hălbac-Cotoară-Zamfir, R., Keesstra, S., & Kalantari, Z. (2019),Throughout the history of Romania, political decisions, socio-economic measures, and cultural (traditional) characters have affected the implementation of environment friendly techniques (EFTs) policies. In the context of this paper, EFTs can be defined as solutions for the use of land resources aiming the increasing of goods for meeting the changing human needs and with neutral or positive environmental impact. Changes in the political regime have always had a visible impact on the EFTs issue in Romania. EFTs have gone through several major phases. The political impact on EFTs implementation mainly affected sustainable land management (SLM) and to a small extent, at the end of the communist era and partly during the capitalist period, climate change mitigation. Throughout history, the political factor has dominated and influenced the capacity of the EFTs implementation process in responding to socio-economic stimuli. In addition, quality of life, rural-urban and urban-rural migrations, poverty, education level, and climate change adaptation have had impacts on the status of EFTs according to governance and political reflections. The agrarian reforms from the last two centuries, based on socio-economic demands, have strongly influenced the capacity to implement EFTs both positively and negatively. However, the cultural factor was least affected by political and socio-economic changes as a stability factor in ensuring continued implementation of the EFTs. Currently, there is a strong need to reconsider EFTs as sustainability tools for Romanian agriculture that can cope with climate change and sustainable land management (SLM) demands.

This paper presents a brief history of EFTs in Romania and their benefits in achieving SLM equilibrium, describing the impacts of political decisions, socio-economic measures, and cultural features on implementing ETFs policies.

Conroy, M. M., & Berke, P. R. (2004),A key question faced by practitioners trying to plan for sustainable development is: what can be done in planning practice to influence promotion of sustainable development? This research addresses that question by investigating three dimensions of the planning process (political support for the concept, participation, and resource commitment), the organization of local land-use plans, and state planning mandates to determine how they influence the support plan policies have for principles of sustainable development. We use plan content analysis as well as survey data for forty-two communities across the United States to analyze factors which influence such support. Our findings highlight that the presence of a state planning mandate, most applicable to US planning, as well as having a variety of groups participating in the planning process, are key factors that increase overall plan support for the sustainable development principles. Recommendations for planning practice are offered based on our findings.

Chams, N., & García-Blandón, J. (2019),Today, firms are becoming increasingly aware of the importance of social, ethical, and ecological objectives. In addition to financial profit, organizations are setting themselves new goals, focusing on individual, communal, and environmental-friendly performance and development. One of the disciplines that is promoting "green" organizations is Sustainable Human Resource Management (SHRM). Sustainable development goals (SDGs) are achieved through the adoption of new ecological techniques by the organization's human capital and by the integration of innovative sustainable strategies. This systematic literature review examines the key role of SHRM in developing a sustainable work environment and in facilitating the attainment of SDGs. Based on a selection of empirical and conceptual articles, this review identifies the antecedents and outcomes of SHRM and highlights the obstacles to sustainable implementation not only at the level of the firm, but also from an international perspective. Four propositions are formulated that might be empirically tested in future studies. Research gaps in the existing literature are identified and potential future directions are suggested for further research in the field of sustainable management.

Lee, T. H., & Jan, F. H. (2019),In this paper, the research gaps in sustainable tourism development were addressed by examining residents' perceptions of the sustainability of community-based tourism based on tourism area life cycle theory. The survey questionnaire was distributed to the residents of six Taiwanese communities, and it was designed to determine the residents' perceptions of the economic, socio-cultural, environmental, and life satisfaction sustainability of tourism. In total, 849 usable questionnaires were collected. The analytical results further elucidated the sustainability of nature-based tourism and suggested that the economic, socio-cultural, and environmental sustainability varied significantly in the consolidation, development, and involvement stages of community-based tourism development. The four dimensions of sustainability were evaluated according to the pre- and post-development perceptions of tourism sustainability, and significantly different results were obtained. The study concludes that the residents' perceptions differed across the developmental stages; thus, managers should consider the development opportunities and adopt appropriate strategies across different development stages.

George C. (1999). This paper investigates the potential of environmental assessment as a sustainability instrument has long been recognized, but the criteria against which development proposals traditionally are judged are not necessarily criteria for sustainable development. Meanwhile, identified the need for indicators of sustainable development for use in decision-making, but those that have been developed are not easy to apply in project level environmental assessment. These problems are addressed by returning to the fundamental principles of sustainable development and relating them to the principles of environmental assessment. In this way, criteria have been derived, all of which must be satisfied if a development proposal is to be classified as sustainable development. These criteria have been tested against a number of actual environmental assessments to identify the likely consequences for project approval.

James, M. and Card, K. (2012), The purpose of this paper is to determine what factors contributed to three universities achieving environmental sustainability. Design/methodology/approach – A case study methodology was used to determine how each factor contributed to the institutions' sustainability. Site visits, fieldwork, document reviews, and interviews with administration, faculty, staff, and students from the participating institutions were employed as primary data collection strategies. Findings – The six factors identified in the

literature as contributing to environmental sustainability were present at all three institutions: green campus operation measures; campus administration, organization, and leadership; teaching, research, and service; campus-wide actions and activities; institutional assessment of campus sustainability measures; and established methods for overcoming barriers. Research limitations/implications – This study was delimited to the six factors that were identified in the literature and the three institutions that participated in this study. The research will add to the literature on creating sustainable campuses and will also provide a foundation for further study on the progress and impact of campus sustainability efforts. Originality/value – A number of individual case studies have described what certain institutions have done. A smaller number of case studies have identified what factors have contributed to certain institutions' achieved environmental sustainability.

Damodaran, Vinita. (1897), This paper addresses one of the most under-researched areas of resource use and management in rural India, that of 'wild resources', and explores the links between ecological change, famine and poverty. It is argued that once deforestation started to take place (in the context of the exploitation of the indigenous people by an outsider landlord class, aided by the colonial state), and the forest department denied people access to traditional famine foods, the Chotanagpur region found itself for the first time subject to the kind of vulnerability to famine that had affected lowland populations for a much longer period.

3. Problem Statement

It is not easy to make a compromise between progress and ecology, reliability and sustainability, between technically practical, viable, safe and economic requirements, between moral responsibility to people and the whole environment and obligations to future generations. Professionals from technical field need to keep in mind their moral responsibility and obligation towards society as a whole. Their professional ethical standards have to transcend commonly accepted morality. Professionals like engineers have obligations to future generations that could be harmed by irresponsible engineering activities, because it may take decades and generations for products and facilities to have adverse effects. They should not act using immoral and unethical rules and laws.

4. Objective

1. Study and investigate the sustainable environment in southern Chotanagpur Division of Jharkhand.
2. Explore the factors contributing to the creation of a sustainable environment in southern of Chotanagpur Division
3. To extract the major signification factors which affect the sustainable environment in southern Chotanagpur Division
4. To develop a frame work for maintaining the sustainable environment in southern Chotanagpur Division and suggest to maintaining environment in whole area.

4.1 Hypothesis

- Data taken from standard resource has significant variation and supposed to be fixed in available resources.
- Significant Underlying factors is only considered for this analysis.

5. Research Methodology/ Tools

Design for the environment is an approach used in modern days to produce quality products at an affordable price without harming our environment. In today's world, global warming is the main concern for the whole world. To tackle this concern, we should implement some techniques or methods while designing products in the lab. Different types of designing and analysis software are developed to fulfill this design for the environmental approach. To design a framework for preserving a sustainable environment in Ranchi and to provide recommendations about the preservation of the environment in Ranchi.

Tools

Advance Excel Analytics (MS Excel 2019)

6. Data Collection

Forest & Environment Ranchi | District Ranchi, Goverment Of Jharkhand | India

https://ranchi.nic.in/forest-environment-ranch

7. Brief Chapter Plan

CHAPTER 1: INTRODUCTION

- Introduction
- Statement of the Problem
- Objectives of the study
- Methodology
- A Data Sources
- Study area and sampling design
- Techniques used
- Chapter scheme

Chapter 2: THEORITICAL PERSPECTIVES AND REVIEW OF LITERATURE

- Introduction
- Theoretical Background
- Concept of Sustainable Environment
- Factors of Sustainable Environment
- Sustainable Environment in India and Jharkhand
- Sustainable Environment in Ranchi
- To Explore the key factors of Sustainability in regional context
- Factors of Sustainability and creation of ecosystem for Sustainability
- Concluding Observations and Gaps in Existing Literature

Chapter 3. RESEARCH METHODOLOGY

- Collection of data (Secondary Data and Primary Data)

- ❖ Exploration of Key Variables
- ❖ Exploration of Key Factors
- ❖ Relational Framework of Key Factors of climates

Chapter 4. ANALYSIS OF DATA

- ❖ Data Exploration
- ❖ Data Analysis by SPSS or Adv Excel
- ❖ Visual Result
- ❖ Data Interpretation
- ❖ Findings of this exploration

Chapter 5. Conclusion and Findings

Chapter 6. Suggestion and Future Scope

7. References

References

1. Kumar, M., Gupta, J., & Radhakrishnan, A. (2016). Sustainability of dairy based livelihoods of the tribes in Ranchi and Dhanbad districts of Jharkhand. *Indian Journal of Dairy Science*, *69*(2), 220.

2. Kumari, N., & Pandey, S. (2022). Sustainability Assessment of Jumar River in Ranchi District of Jharkhand using River Sustainability Bayesian Network (RSBN) model Approach. In *Ecological Significance of River Ecosystems* (pp. 407-428). Elsevier.

3. Mehta, S., & Kumar, A. (2019). *Towards inclusive and sustainable smart cities: The case of Ranchi* (No. 81). ORF Special Report.

4. Kumar, M., Gupta, J., Radhakrishnan, A., & Singh, M. (2015). Pig-based production system contributing towards the sustainable livelihood of tribes of Jharkhand. *International Journal of Farm Sciences*, *5*(4), 290-298.

5. Hălbac-Cotoară-Zamfir, R., Keesstra, S., & Kalantari, Z. (2019). The impact of political, socio-economic and cultural factors on implementing environment friendly techniques for sustainable

land management and climate change mitigation in Romania. *Science of the Total Environment, 654*, 418-429.

6. Conroy, M. M., & Berke, P. R. (2004). What makes a good sustainable development plan? An analysis of factors that influence principles of sustainable development. *Environment and planning A*, *36*(8), 1381-1396.

7. Chams, N., & García-Blandón, J. (2019). On the importance of sustainable human resource management for the adoption of sustainable development goals. *Resources, Conservation and Recycling*, *141*, 109-122.

8. Lee, T. H., & Jan, F. H. (2019). Can community-based tourism contribute to sustainable development? Evidence from residents' perceptions of the sustainability. *Tourism Management, 70*, 368-380.

9. George C. (1999), "Testing for sustainable development through environmental assessment, Environmental Impact Assessment Review", Volume 19, Issue 2,Pages 175-200.

10. James, M. and Card, K. (2012), "Factors contributing to institutions achieving environmental sustainability", *International Journal of Sustainability in Higher Education*, Vol. 13 No. 2, pp. 166-176. https://doi.org/10.1108/14676371211211845

11. Damodaran, Vinita. (1897), "Famine in a Forest Tract: Ecological Change and the Causes of the Famine in Chotanagpur, Northern India." Environment and History 1, no. 2 (June 1995): 129–58.

12. Khan .K., Babar, S.F., Oryani, B. *et al.* (2022). "Role of financial development, environmental-related technologies, research and development, energy intensity, natural resource depletion, and temperature in sustainable environment in Canada". *Environ Sci Pollut Res* **29**, 622–638. https://doi.org/10.1007/s11356-021-15421-0